The Coleopterists Bulletin, 67(1): 23–27. 2013.

Description of the Second and Third Instars of *Laccornellus lugubris* (Aubé) (Coleoptera: Dytiscidae: Hydroporinae)

Mariano C. Michat
CONICET - Laboratorio de Entomología, DBBE, FCEyN
Universidad de Buenos Aires, Buenos Aires, ARGENTINA
marianoide@gmail.com

AND

Miguel Archangelsky
CONICET - Laboratorio de Investigaciones en Ecología y Sistemática Animal
Universidad Nacional de La Patagonia, San Juan Bosco
Sarmiento 849, 9200 Esquel, Chubut, ARGENTINA
hydrophiloidea@yahoo.com.ar

Abstract

The second and third instars of *Laccornellus lugubris* (Aubé) are described and illustrated for the first time, including detailed morphometric and chaetotaxic analyses of the cephalic capsule, head appendages, legs, last abdominal segment, and urogomphi. *Laccornellus* Roughley and Wolfe shares with *Canthyporus* Zimmermann a similar shape and secondary setation of the last abdominal segment, the absence of secondary spine-like setae on the lateral margins of the parietal, and the presence of well-developed spinular pectens on the ventral surface of the femora (this last character also is shared with *Laccornis* Gozis). On the other hand, larvae of *Laccornellus* differ from those of *Canthyporus*, *Laccornis*, and *Hydrovatus* Motschulsky in the presence of secondary pores on the ventral surface of the prementum and of secondary setae on the tibia, metatarsus, and anterodorsal surface of femur. The known distributional range of *L. lugubris* is considerably expanded.

Key Words: diving beetle, larval morphology, morphometry, chaetotaxy

---

The South American endemic genus *Laccornellus* Roughley and Wolfe includes two species (*Laccornellus copelatoides* (Sharp) and *Laccornellus lugubris* (Aubé)) of small diving beetles of the subfamily Hydroporinae. The genus is presently included in the tribe Hydroporini (Nilsson 2001), though several independent studies based on adult (Roughley and Wolfe 1987; Wolfe 1988; Miller *et al*. 2006) and larval (Alarie and Michat 2007) morphology strongly suggested a position of *Laccornellus* outside the Hydroporini, more closely related to members of other, more ancestral tribes such as Methlini, Laccornini, and possibly Hydrovatini. The genera *Laccornellus* and *Canthyporus* Zimmermann are postulated to be very closely related phylogenetically (Roughley and Wolfe 1987; Nilsson 1991).

Laccornellus lugubris is a rare species known so far from Uruguay, central-eastern Argentina, and southern Brazil (Roughley and Wolfe 1987; Trémouilles 1995; Benetti and Régil Cueto 2003). The fact that *Laccornellus* is the only genus of the Hydroporini present in South America, summed to its presumably plesiomorphic condition, place it as a very interesting group of beetles both from a biogeographic and a phylogenetic point of view.

The larva of *L. lugubris* was described in detail by Alarie and Michat (2007). However, as at that time only the first instar was available, several characters (mainly from secondary chaetotaxy and morphology) could not be observed. The recent discovery of larvae of this species in Patagonia allows us to fill this gap by providing descriptions of the later instars. The purposes of our study, therefore, are 1) to provide detailed descriptions and illustrations of the second- and third-instar larvae of *L. lugubris*, following the template used in the description of the first instar (Alarie and Michat 2007) and 2) to compare and discuss some morphological and secondary chaetotaxy characters that can help provide additional evidence for the classificatory position of *Laccornellus* within the Hydroporinae.

Material and Methods

Three specimens of instar II and three of instar III were used for the descriptions. Larvae were collected in association with adults at the following locality: Argentina, Chubut Province, Aldea Escolar, portion of stagnant water in a small creek, 25 January 2008.

Specimens were cleared in lactic acid, dissected, and mounted on glass slides with polyvinyl-lactoglycerol. Observations (at magnifications up to 1000X) and drawings were made using an Olympus CX31 compound microscope equipped with a camera lucida. Drawings were scanned and digitally edited. The material is held in the collections of the authors.

The methods and terms used in the present paper follow those employed in previous papers dealing with the larval morphology and chaetotaxy of members of the subfamily Hydroporinae. The reader is referred to Alarie and Michat (2007) and Michat *et al*. (2007) for a complete list of the terms commonly used in the study of dytiscid larvae.

Results

Laccornellus lugubris (Aubé, 1838)
Second instar

Description. As instar I (Alarie and Michat 2007) except as follows. **Color**: Color pattern of cephalic capsule as in Fig. 1 but somewhat more diffused; thoracic and abdominal tergites I-VI dark brown with some white maculae. **Body**: Measurements and ratios that characterize the body shape are shown in Table 1. **Head capsule**: Occipital suture present; nasale with 2 small lateral branches on each side; egg bursters absent; anteroventral margin of nasale with 34 lamellae clypeales. **Antenna**: A2 and A3 subequal in length. **Maxilla**: MP longer than LP. **Legs**: Surface spinulae absent except for elongate ventral spinulae on FE, TI, and TA. **Abdomen**: Segment VII completely sclerotized, ring-like; LAS with anterotransverse carina. **Chaetotaxy**: Head capsule with numerous short, either thin or moderately thick secondary setae (absence of robust spine-like setae); parietal with several temporal secondary setae; MN with 1 hair-like secondary seta on basoexternal margin; prementum with 1 secondary pore on ventral surface; prothoracic tergite with numerous secondary setae covering the whole surface; meso- and metathoracic tergites and abdominal sclerites I-VIII with numerous secondary setae covering the entire

Fig. 1. *Laccornellus lugubris*, third instar, head, dorsal view. Scale bar = 0.20 mm.

Table 1. Measurements and ratios for the second and third instars of *Laccornellus lugubris*.

Measure	Instar II (n = 2)	Instar III (n = 3)
TL (mm)	4.10–4.20	6.50–6.70
MW (mm)	0.75–0.80	1.20–1.30
HL (mm)	0.74–0.75	1.08–1.12
HW (mm)	0.57–0.59	0.81–0.87
FRL (mm)	0.59–0.61	0.82–0.86
OCW (mm)	0.39–0.43	0.56–0.65
HL/HW	1.27–1.29	1.28–1.33
HW/OCW	1.40–1.49	1.30–1.46
COL/HL	0.18–0.20	0.23–0.24
FRL/HL	0.80–0.82	0.76–0.77
A/HW	0.74–0.75	0.70–0.73
A3/A1	2.43–2.46	2.00–2.15
A3/A2	1.06–1.07	0.83–0.98
A4/A3	0.29–0.34	0.31–0.33
A3′/A4	0.73–0.80	0.77–0.86
MNL/MNW	4.00–4.10	3.61–3.96
MNL/HL	0.53–0.54	0.49–0.50
A/MP	1.05–1.06	1.08–1.13
MP2/MP1	1.19–1.29	0.88–0.89
MP2/MP3	2.86–3.17	3.67–4.00
MP/LP	1.28–1.31	1.22–1.24
LP2/LP1	1.29–1.41	0.92–0.98
L3 (mm)	1.68	2.34–2.46
L3/L1	1.28–1.29	1.29–1.31
L3/L2	1.14–1.16	1.15–1.17
L3/HW	2.83–2.93	2.82–2.97
L3 (CO/FE)	0.99–1.01	1.07–1.08
L3 (TI/FE)	0.66	0.64–0.65
L3 (TA/FE)	0.71	0.59–0.63
L3 (CL/TA)	0.59	0.57
LAS (mm)	0.63–0.65	1.04–1.08
LAS/HW	1.10	1.24–1.31
U (mm)	1.47–1.48	1.48–1.59
U/LAS	2.26–2.32	1.37–1.53
U/HW	2.48–2.56	1.80–1.96
U1/U2	0.53–0.57	0.52–0.57

surface except anterior fourth; secondary leg setation detailed in Table 2.

Third instar
(Figs. 1–4)

Description. As instar II except as follows. **Body**: Measurements and ratios that characterize the body shape are shown in Table 1. **Head capsule** (Fig. 1): Lateral branches of nasale somewhat more developed, visible dorsally or not; anteroventral margin of nasale with 64–65 lamellae clypeales. **Maxilla**: MP1 the longest. **Labium**: LP1 and LP2 subequal in length. **Thorax**: Spiracles present on mesothorax. **Abdomen**: Spiracles present on segments I-VII. **Chaetotaxy**: Secondary setation on cephalic capsule (Fig. 1), thoracic and abdominal sclerites more abundant; secondary leg setation detailed in Table 2 and Figs. 2–3; secondary setation on LAS detailed in Fig. 4.

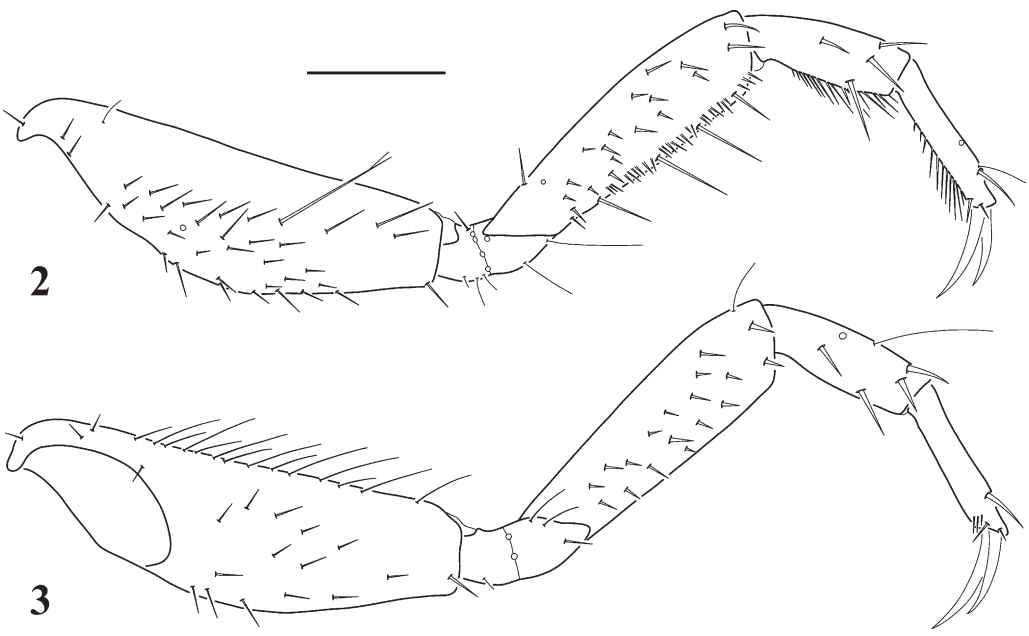
Distribution. *Laccornellus lugubris* is a rare species collected only sporadically and always in low numbers of specimens. Previous to this study, it was known from Uruguay, central-eastern Argentina (Buenos Aires and Entre Ríos Provinces), and southern Brazil (Roughley and Wolfe 1987; Trémouilles 1995; Benetti and Régil Cueto 2003). The finding of both adults and larvae in Patagonia (Chubut Province) considerably expands the southern distributional limit of the species. This collection event, together with the collection of adults in recent years in Río Negro, Santiago del Estero, and Misiones Provinces, suggests that *L. lugubris* occupies a vast area within Argentina, including (at least) most of the eastern part of the country and the Patagonian region.

Discussion

A recent study of the larval morphology and primary chaetotaxy of the Hydroporinae (Alarie and Michat 2007) suggested that *Laccornellus* represents an early offshoot of the Hydroporinae along with *Celina* Aubé, *Canthyporus*, *Hydrovatus* Motschulsky, and *Laccornis* Gozis. Larvae of all these genera are characterized by the presence of a small galea, a condition not found in any other known hydroporine larva (Michat *et al.* 2007) (the presence of such a feature in *Canthyporus* needs corroboration). Whereas *Celina* was postulated to represent the sister-group to all Hydroporinae, *Laccornellus*, *Canthyporus*, and *Hydrovatus* were deemed to form a distinct clade, all three genera being characterized by the absence of the primary setae LA2 on the prementum and UR8 on the urogomphus (Alarie and Michat 2007). The present paper is focused on second- and third-instar larvae, and therefore explores only the secondary chaetotaxy characters and how they contribute to the classificatory position of *Laccornellus* within the aforementioned genera. In this context, the mature larvae of *Laccornellus* and *Canthyporus* (Shaverdo and Alarie 2006) were found to be characterized by the absence of secondary spine-like setae on the lateral margins of the parietal and the presence of well-developed spinular pectens on the ventral surface of the femora. This last character is also present in larvae of *Laccornis* (Alarie 1989), suggesting a close relationship of the three genera. The similar shape and secondary setation of the last abdominal segment of *Laccornellus* and *Canthyporus* larvae also suggest a close relationship, in agreement with the traditional placement of the group based on adult morphology (Roughley and Wolfe 1987; Nilsson 1991). On the other hand, the larvae of *Laccornellus*

Table 2. Number and position of secondary setae on the legs of the second and third instars of *Laccornellus lugubris*. Numbers separated by slash marks refer to pro-, meso-, and metathoracic legs, respectively. A = anterior, D = dorsal, Di = distal, P = posterior, Pr = proximal, V = ventral, Total = total number of secondary setae on the segment (excluding primary setae).

Segment	Position	Instar II (n = 2)	Instar III (n = 3)
Coxa	A	5-6 / 4 / 4	10-15 / 7-16 / 11-17
	P	0-2 / 1-2 / 3-4	7-9 / 6-11 / 6-13
	PD	5 / 5-6 / 5-6	9-13 / 9-13 / 9-10
	V	5-6 / 5-8 / 3-6	9-16 / 11-19 / 12-15
	Total	16-18 / 15-20 / 15-20	35-52 / 38-54 / 39-49
Trochanter	Di	0 / 0 / 0	0-1 / 0 / 0-1
	Pr	1 / 1 / 1-3	2-4 / 2-3 / 3-4
	Total	1 / 1 / 1-3	2-4 / 2-3 / 3-5
Femur	A	4 / 4-7 / 7	7-17 / 8-16 / 10-18
	AD	0 / 0 / 1-2	0-1 / 0-1 / 1-4
	AV	2 / 2 / 1-3	0-4 / 2-4 / 3-4
	P	5-7 / 2-5 /2-3	9-16 / 6-8 / 2-6
	PD	0 / 0 / 0	0 / 0-1 / 0-1
	PV	0-2 / 0-2 / 1-2	0-5 / 0-2 / 2
	Total	13 / 11-13 / 14-15	25-32 / 18-28 / 22-31
Tibia	A	1-2 / 2-3 / 0-3	0-1 / 1-3 / 2-4
	AD	0 / 0-2 / 2-3	0 / 0-2 / 2-4
	AV	0 / 0 / 1-2	0 / 0-1 / 1-2
	P	1-2 / 1-2 / 0-3	0-1 / 0-2 / 0-4
	PD	0 / 0-1 / 1-2	0 / 1 / 1
	PV	0 / 0 / 0-1	0 / 0-1 / 1-2
	Total	2-4 / 4-7 / 7-11	1-2 / 5-6 / 10-15
Tarsus	A	0 / 0-1 / 2	0 / 0 / 0-1
	AD	0 / 0 / 0	0 / 0 / 1-2
	P	0 / 0-1 / 0-1	0 / 0 / 0-1
	Total	0 / 0-2 / 2-3	0 / 0 / 1-3



Figs. 2–3. *Laccornellus lugubris*, third instar. **2)** Left prothoracic leg, anterior view; **3)** Right prothoracic leg, posterior view. Scale bar = 0.20 mm.

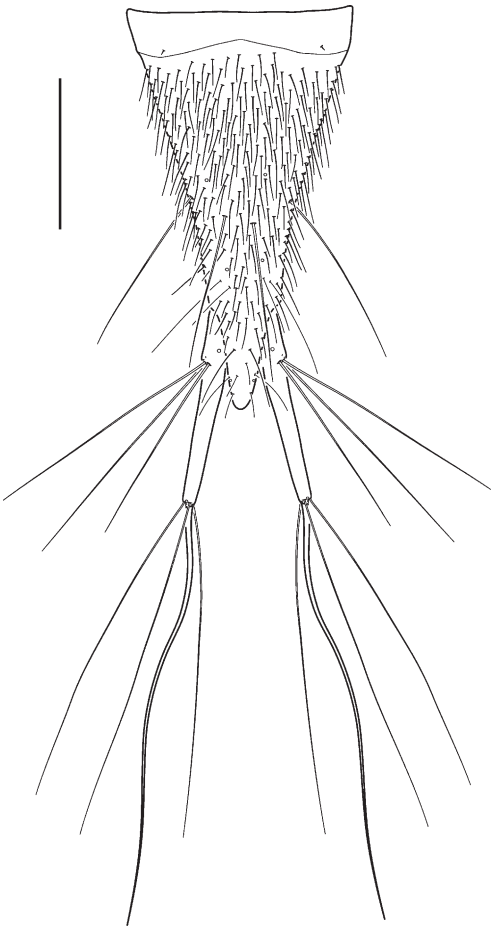


Fig. 4. *Laccornellus lugubris*, third instar, abdominal segment VIII and urogomphi, dorsal view. Scale bar = 0.40 mm.

differ from those of *Canthyporus*, *Laccornis*, and *Hydrovatus* (Michat 2006) in the presence of secondary pores on the ventral surface of the prementum and of secondary setae on the tibia, metatarsus, and anterodorsal surface of femur, all these characters being present in *Celina* (Michat *et al.* 2007) and therefore linking both genera.

Acknowledgments

We thank the anonymous referees for their useful comments on the manuscript. Laboratory work by MCM was supported by project PIP 112-200801-02759 from Consejo Nacional de Investigaciones Científicas y Técnicas and project PICT-2010-0526 from Agencia Nacional de Promoción Científica y Tecnológica. This is contribution n° 90 from the Laboratorio de Investigaciones en Ecología y Sistemática Animal.

References Cited

Alarie, Y. 1989. The larvae of *Laccornis* Des Gozis 1914 (Coleoptera: Adepaga: Dytiscidae) with description of *L. latens* (Fall 1937) and redescription of *L. conoideus* (Leconte 1850). The Coleopterists Bulletin 43: 365–378.

Alarie, Y., and M. C. Michat. 2007. Phylogenetic analysis of Hydroporinae (Coleoptera: Dytiscidae) based on larval morphology, with description of first instar of *Laccornellus lugubris*. Annals of the Entomological Society of America 100: 655–665.

Benetti, C. J., and J. A. Régil Cueto. 2003. Primera cita de la tribu Hydroporini Aubé, género *Laccornellus* Roughley & Wolfe (Coleoptera, Dytiscidae, Hydroporinae) para Brasil. Boletín de la Sociedad Entomológica Aragonesa 32: 157–159.

Michat, M. C. 2006. The phylogenetic position of *Hydrovatus* Motschulsky: evidence from larval morphology of *H. caraibus* Sharp (Coleoptera: Dytiscidae: Hydroporinae). Insect Systematics & Evolution 37: 419–432.

Michat, M. C., Y. Alarie, P. L. M. Torres, and Y. S. Megna. 2007. Larval morphology of the diving beetle *Celina* and the phylogeny of ancestral hydroporines (Coleoptera: Dytiscidae: Hydroporinae). Invertebrate Systematics 21: 239–254.

Miller, K. B., G. W. Wolfe, and O. Biström. 2006. The phylogeny of the Hydroporinae and classification of the genus *Peschetius* Guignot, 1942 (Coleoptera: Dytiscidae). Insect Systematics & Evolution 37: 257–279.

Nilsson, A. N. 1991. On the genus *Canthyporus* Zimmermann (Coleoptera, Dytiscidae), with a new species from the Highlands of Ethiopia. Aquatic Insects 13: 183–188.

Nilsson, A. N. 2001. World Catalogue of Insects, Volume 3: Dytiscidae (Coleoptera). Apollo Books, Stenstrup, Denmark.

Roughley, R. E., and G. W. Wolfe. 1987. *Laccornellus* (Coleoptera: Dytiscidae), a new hydroporine genus from austral South America. Canadian Journal of Zoology 65: 1346–1353.

Shaverdo, H. V., and Y. Alarie. 2006. Description of the larva of *Canthyporus kenyensis* Bilardo & Sanfilippo (Coleoptera: Dytiscidae: Hydroporinae) with implication for the phylogeny of the Hydroporini. Aquatic Insects 28: 113–130.

Trémouilles, E. R. 1995. Dytiscidae: Methlinae-Hydroporinae [pp. 1–82]. *In*: Fauna de Agua Dulce de la República Argentina 37 (Z. A. de Castellanos, editor). Estudio Sigma SRL, Buenos Aires, Argentina.

Wolfe, G. W. 1988. A phylogenetic investigation of *Hydrovatus*, Methlini and other plesiotypic hydroporines (Coleoptera: Dytiscidae). Psyche 95: 61–71.

(Received 28 September 2012; accepted 27 December 2012. Publication date 20 March 2013.)